

# Trends in the Production and Absorption of Rubber<sup>1</sup>

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UNTIL the beginning of the present century the world received all of its supplies of rubber from trees growing naturally in tropical countries—mainly the Amazon Valley and central Africa. At the present time, however, nearly 98 percent of the world's annual requirements of rubber are derived from plantations. The crude product comes from the latex which issues when the bark of the rubber tree is cut. The latex is collected, coagulated with acid, and the coagulum washed and dried. In this form crude rubber enters commerce, although in recent years there has been a growing demand for rubber in latex form.

The plantation-rubber industry is largely centered in the East Indies under Dutch and British control. Early experimental work in the cultivation of the rubber tree was carried on in the last quarter of the nineteenth century. It was not until the advent of the automobile and the pneumatic tire, however, that wild rubber proved inadequate to meet the demand, which, prior to that time, had expanded very gradually. At the turn of the century not more than 5,000 acres had been planted, according to available estimates. The boom in automobile production after that time, however, put a strain on supplies and the price rose steadily to a high of \$3 per pound in 1910. Under this stimulus, planting proceeded at a rapid rate, and at the end of 1937 nearly 8½ million acres were planted in rubber.

Growth of the automobile industry and expansion of rubber output have gone hand in hand; in 1937, the 40 million motor vehicles in existence used almost three-quarters of a million tons of crude rubber, or roughly two-thirds of the world's consumption during that year. Crude rubber goes into a very large number of other uses, of which the most important are mechanical rubber goods, footwear, insulation materials, and bicycle tires.

## Half the Production Area Now in Estates.

Crude rubber is of two types—plantation rubber, which is derived from cultivated trees, and wild rubber, which is obtained from the naturally occurring trees. It was not until 1914 that plantation rubber production exceeded the output of wild rubber. Since that time plantation production has increased rapidly, whereas wild rubber output has declined; at the present time this latter source supplies only a very minor portion of the total output.

Of the total area planted in 1937, a little more than half was on estates. Such estates contain over 100 acres of rubber trees, with the average area of planted rubber held by companies and individuals about 3,000 acres. The balance, or about 47 percent, is made up of small holdings owned by natives. Although a few native holdings exceed 100 acres, the average approximates only 3 acres. Netherlands East Indies and British Malaya each have nearly 40 percent of the total area under rubber. About one-fourth of the total plantation-rubber area is under British ownership. Dutch interests account for slightly more than 8 percent, and American-controlled acreage is about 3 percent. Of the 1,136,000 tons of rubber produced in 1937, a little more than 55 percent came from estates,

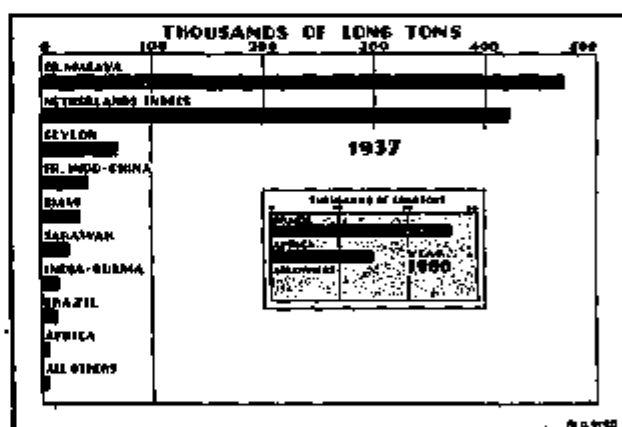


Figure 1.—World Rubber Production, 1936 and 1937.

and, with the exception of about 2 percent of wild rubber, the rest came from native acreage.

Expansion of rubber acreage is closely related to the movement of prices. High prices between 1910 and 1920 resulted in a period of heavy planting, but as prices receded plantings were curtailed. During the mid-1920's, when the Stevenson restriction plan was in operation and rubber prices moved upward, planting was again stimulated. Since 1929, planting has declined rather sharply and under the present international agreements new extensions, with a few exceptions, have been prohibited in all countries signatory to this agreement.

Estate producers generally look upon their property as a source of income from the long-term point of view, whereas the native holder, as a rule, looks upon his acreage as a source of immediate income. Estate managers arrange their tapping and planting policy to insure continuity of production over a long period of

<sup>1</sup> The data for this article are taken from a recent publication of the Bureau of Foreign and Domestic Commerce, "Rubber Statistics 1900-1937—Production, Absorption, Stocks and Prices" (Trade Promotion Series 161) and from an article, "The Statistics of the Rubber Industry," by George Roe, appearing in the *Journal of the Royal Statistical Society*, part II, vol. 101.

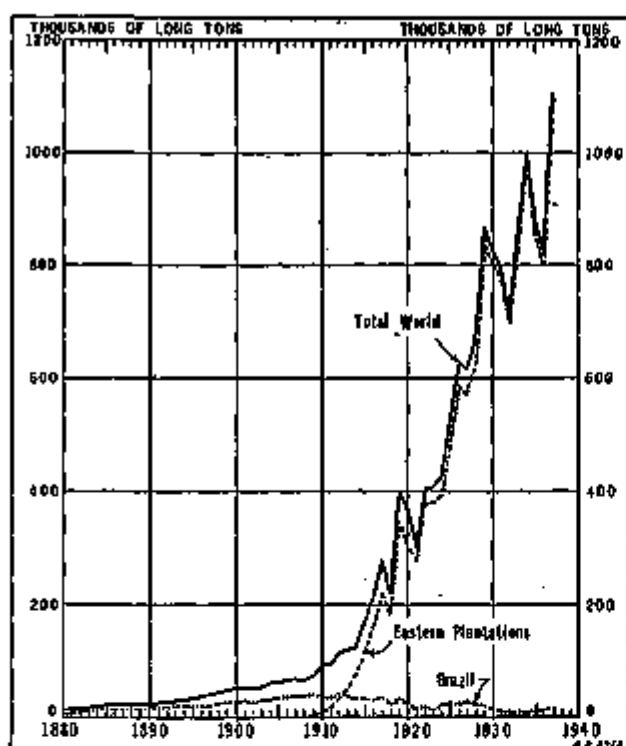


Figure 2.—Estimated World Rubber Production, 1880-1937.

time. Thus the effects of a low and declining price on the output of rubber is more direct in the case of native holdings than in the case of estates, and when prices rise after a prolonged period of low prices, native output responds more quickly than estate output.

Table 1 presents a historical record of production of rubber, by chief producing areas.

Table 1.—Estimated World Rubber Production, 1900-37

[Thousands of long tons]

Year	Middle East	Amazon Valley	Mexican Guayule	Other America	Africa	Total
Average, 1900-1904	1	29		1	15	47
Average, 1905-1909	5	30	4	5	19	59
Average, 1910-1914	35	37	5	12	10	109
Average, 1915-1919	206	31	1	10	5	257
1920	325	23		0	7	355
1921	378	17	(1)	3	4	402
1922	399	19	(1)	4	3	430
1923	390	17		5	3	420
1924	464	25	1	3	6	500
1925	489	25	1	3	7	525
1926	552	24	1	3	8	588
1927	562	29	1	3	8	603
1928	622	21	1	2	8	654
1929	635	21	1	1	8	666
1930	602	14	1	1	8	626
1931	768	12		(1)	8	789
1932	700	6		(1)	8	715
1933	691	10		(1)	8	709
1934	1,006	9	(1)	(1)	8	1,024
1935	855	11	(1)	1	8	875
1936	884	14	1	1	8	898
1937	1,100	15	2	1	8	1,126

1 Less than 500 long tons.

#### United States Uses Three-fourths of Crude Rubber Output.

The term "absorption" is used in the rubber industry to mean the crude rubber converted into manufactured rubber goods each year. Only a negligible quantity of crude is absorbed in producing countries, and it may be assumed that net imports into manufacturing countries

for any year approximately represent absorption. With the exception of the United States and the United Kingdom, there is available no better method of estimating the rubber-manufacturing activity of a country than as measured by its net imports.

About 75 percent of the annual absorption of crude rubber in the United States in recent years has gone into the manufacture of automobile tires and tubes; in earlier years the percentage was even higher. The absorption by the automobile industry in other countries is not known, but it is probably in the neighborhood of 60 percent of the total consumption.

Absorption of rubber outside the automobile industry has shown a steady increase, mainly as a result of the development of new uses for the commodity. The widespread nature of these uses and their continuous growth in numbers helped to maintain crude rubber requirements during the depression. Thus, it is largely because of its dependence on the automobile industry that the rubber industry is susceptible to such wide fluctuations. During the depression years, the decrease in annual world absorption of crude rubber was entirely the result of the lower requirements in the United States, which drop was, in turn, mainly in rubber consumed in making tires and tubes. As conditions in the United States improved after 1932, however, the increase in absorption was very rapid, amounting to 70 percent between 1932 and 1936.

Table 2.—Estimated World Rubber Absorption, 1900-37

[Thousands of long tons]

Year	United States	United Kingdom	Germany	Japan	France	Other countries	Total
Average, 1900-1904	23	8	10		3	11	55
Average, 1905-1909	31	11	11		4	16	73
Average, 1910-1914	53	20	14	1	5	23	113
Average, 1915-1919	15	25		5	14	23	218
1920	206	28	12	5	14	21	286
1921	178	18	22	22	15	22	277
1922	303	30	25	10	24	26	408
1923	310	27	19	15	27	20	440
1924	320	23	22	20	30	22	457
1925	383	38	24	11	33	28	517
1926	365	40	23	18	31	20	517
1927	373	45	20	21	34	24	537
1928	437	40	28	25	38	29	597
1929	467	72	40	34	29	121	763
1930	376	75	45	33	29	111	769
1931	365	77	48	43	46	128	867
1932	337	79	45	40	41	134	836
1933	413	80	54	67	62	150	926
1934	482	710	58	76	20	128	1,324
1935	483	65	63	55	21	130	1,317
1936	576	100	72	82	27	130	1,617
1937	544	115	98	82	28	226	1,693

1 Less than 500 long tons.

#### Data on Stocks Now More Adequate.

Statistics for rubber stocks are not available for a long period of years. Prior to 1914, rubber in the hands of dealers in New York, Liverpool, Para, and Antwerp, together with rubber afloat to the United States and Europe from Para, comprised the total reported world rubber stocks. Although plantation rubber from the Middle East took first place in total world rubber production in 1914, it was not until after

the World War embargoes and control measures had been removed that regular statistics for rubber stocks became available. With the resumption of world trade in rubber in 1919, the stocks of plantation rubber held in leading manufacturing countries were built up and became a factor in the statistical position of the commodity. Figures for rubber stocks at the numerous points of absorption have become available at various times since 1919; subsequent to January 1, 1930, there have been comparable monthly statistics at principal world warehouse points.

World stocks may conveniently be divided into three groups: (1) stocks in producing countries, (2) quantities afloat, and (3) stocks in manufacturing countries. Because rubber deteriorates when stored for any length of time in the East, stocks in the major producing countries are generally maintained at a low but fairly steady ratio to output. Stocks on estates in Malaya and Netherlands East Indies (these estates produce about one-half the world's plantation rubber) average about three-quarters of a month's output. Native producers carry very small stocks, probably averaging less than a quarter of a month's output. Quantities afloat are not accurately known, but at the end of any month they roughly approximate the quantity exported from producing countries during the month plus one-third of the exports during the previous month, assuming, of course, a steady rate of shipments.

Complete and reliable data for stocks in manufacturing countries are available only for the United States and the United Kingdom, but, since four large manufacturers in the United States and one in the United Kingdom account for about one-half of the total world absorption, and since the large manufacturers as a rule carry larger stocks in proportion to output than small operators, the stock statistics are not so inadequate as it would seem at first glance. Between 1920 and 1937 the ratio of total declared stocks outside existing regulation areas at the end of each year to average monthly world absorption during the year ranged from a low of 3.2 at the end of 1925 to 10.3 at the end of 1931 and 10.2 at the end of 1932. That is, stocks at the end of 1932 were 10.2 times monthly average absorption. This ratio declined each year from 1931 to 5.0 at the end of 1936, then advanced to 5.5 at the end of 1937.

Table 2.—Principal World Rubber Stocks, December 31  
(Thousands of long tons)

Year	British Malaya <sup>1</sup>	London and Liverpool	United States	Total about	Total
1920.....	79	73	122	86	370
1921.....	88	119	201	88	496
1922.....	82	137	222	83	514
1923.....	77	95	379	81	630
1924.....	87	82	308	116	653
1925.....	91	135	358	125	709
1926.....	92	141	312	88	633
1927.....	92	78	223	167	460
1928.....	91	68	292	135	516

<sup>1</sup> Comprising stocks at: (1) Malayan estates, (2) Straits Settlements dealers, (3) other Malayan dealers, and (4) Malayan ports.

Even though there were no variations in production and absorption, stocks would still be influenced by seasonal change. Absorption is usually high in the middle of the year when arrivals are low, but these purely seasonal variations can be calculated and allowed for and need affect price only temporarily.

#### Prices of Rubber Fluctuate Widely.

Rubber has been subject to wide changes in price; for example, it reached a high of almost \$3 a pound in New York in 1910, was quoted at \$1.23 in 1925, and at a low of under 3 cents a pound in 1933. The highest recorded price for rubber is that mentioned in the preface to the book by Dr. Joseph Priestley (in 1770) of 3 shillings for a cubical piece of about half an inch, which means about \$175 a pound. Ten years later, bottle rubber from Brazil sold in London for a guinea an ounce, or about \$80 a pound.

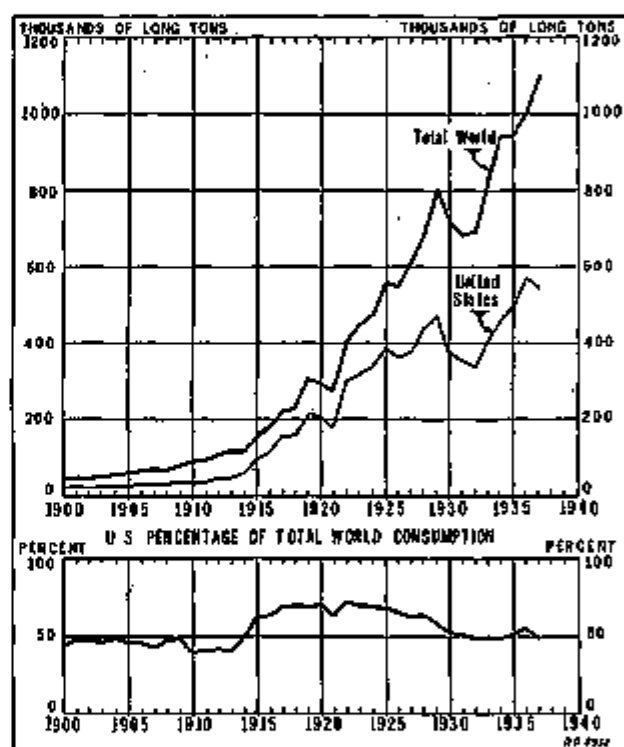


Figure 3.—Estimated World Rubber Consumption, 1900-37.

During the vulcanization experiments of Charles Goodyear, from 1835 to 1851, rubber sold at prices ranging from 5 to 50 cents a pound, according to quality. Rubber appears to have been given an arbitrary value in early import statistics. In "Wholesale Prices, Wages, and Transportation," by Senator Nelson W. Aldrich (of Rhode Island), a report to the Committee on Finance, published by the Government Printing Office in 1893, the prices of rubber are recorded for the period from 1856 to 1891, and vary from 32 cents to \$1.20 per pound. For the period 1892 to date, rubber prices are available from the India Rubber World.

The commodity accepted on the market as rubber today varies radically from the rubber of commerce 20 years ago—which, in turn, was entirely different from the rubber in 1860 and earlier. Fine Para rubber

from the Amazon Valley was for many years the standard product of commerce, and, even today, because of its relative scarcity and the particularized uses to which it is suited, commands a premium over plantation grades.

Plantation rubber was first sold in London in 1900; the sale consisted of 327 pounds from Perak, British Malaya, at 3s. 10d. (\$0.93) a pound. In 1902, six cases of fine rubber from Ceylon were auctioned in London at 3s. 4½d. (\$0.82) a pound. Sheet rubber from plantations in the Middle East made its first appearance at London rubber auctions in May 1905 and brought 6s. 8d. (\$1.62) a pound; it reached its highest price there on April 10, 1910, at 12s. 10d.

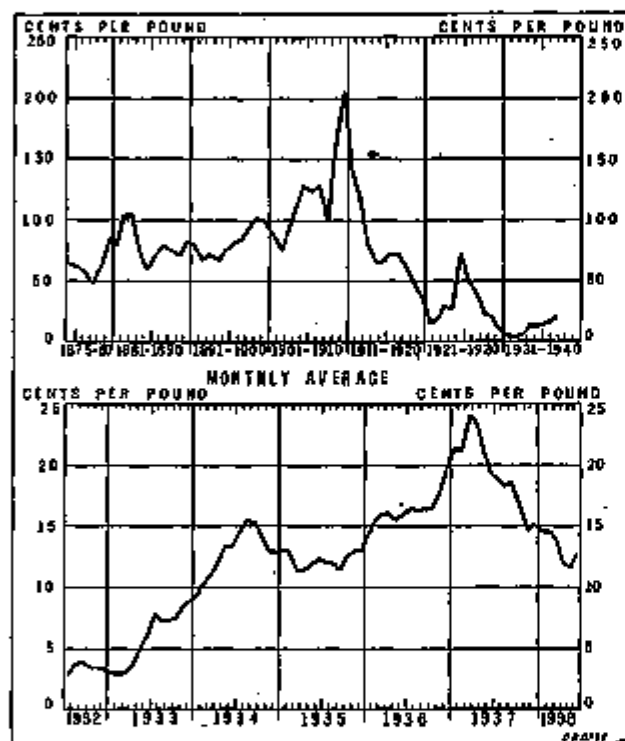


Figure 4.—United States Crude Rubber Prices, 1875-1938.

(\$3.12). Popularity of the bicycle and the demand for rubber tires brought about the high prices in the 1890's; similarly, the automobile and the Brazilian scheme for valorization of rubber were directly responsible for the high prices of 1905 to 1910. In this latter boom period, jungle areas of the world were scoured for supplies. There were over 300 different grades of rubber and rubber-like gums reported; and as many as 20 grades of Brazilian rubber, 20 other South American, 10 Central American, and 50 African grades on the market, for which prices were quoted with some degree of regularity. In 1914, plantation rubber exceeded the amount of wild rubber on the market; and from that time on, the number of varieties marketed declined, until in 1937 there were quotations for less than 20 grades of wild rubber regularly available in New York.

#### Reclaimed Rubber Accounts for Nearly One-Third of Domestic Consumption.

The chemical composition and properties of reclaimed rubber are different from those of crude, since the reclaim still contains sulphur and other ingredients. Articles with high reclaimed rubber content have poor elasticity and poor resistance to abrasion. Thus in rubber tires the proportion of reclaim to crude is low, but in other manufactured goods which are not subject to abrasion the proportion may be high. In some products it is used as a compounding agent for which crude is not desirable; thus its use is not entirely that of a substitute when crude is high in price. In fact, the price of reclaim was above that of crude in 1932.

Reclaimed rubber made up about 29 percent of the total rubber absorbed in the United States in 1937. In 1927 and 1928, more than one-half the tonnage used was of a reclaimed nature; and even at the bottom of the depression, when crude was selling at approximately 3 cents per pound, more than one-fifth of the total absorption was reclaimed rubber.

Data on the extent of absorption outside the United States are meager, but they indicate a gradual increase in the proportion of the reclaim used, although the relative absorption is much less than that in the United States.

#### Rubber Consumption Lower in 1938.

Domestic rubber consumption in the first 6 months of 1938 totaled 171,344 long tons, a decline of 45 percent from the figure of 312,471 tons in the first 6 months of 1937, according to estimates of The Rubber Manufacturers Association, Inc. At no other time since 1924 has the first 6 months' consumption figure been lower than that of 1938. The immediate effect upon the rubber situation of low United States consumption and the less than proportionate decrease in imports was to increase United States rubber inventories from 262,000 tons at the beginning of the year to an estimated 305,000 tons at the end of June 1938, thus adding 43,000 tons to the world visible rubber stocks. Recognition of the low consumption rate in the United States was taken by the International Rubber Regulation Committee in reducing the permissible exportable percentage from 70 to 60 percent for the second quarter and to 45 percent for the third quarter, the lowest percentage allowable under the present restriction scheme.

The lower level of employment in rubber manufacturing plants reporting to the Bureau of Labor Statistics is indicative of the marked decline in activity in the rubber industry in the United States from June 1937 to June 1938. In this period of comparison, all industrial employment declined 25 percent and pay rolls declined 35 percent, while employment in rubber manufacturing industries declined 30 percent and pay rolls 39 percent.